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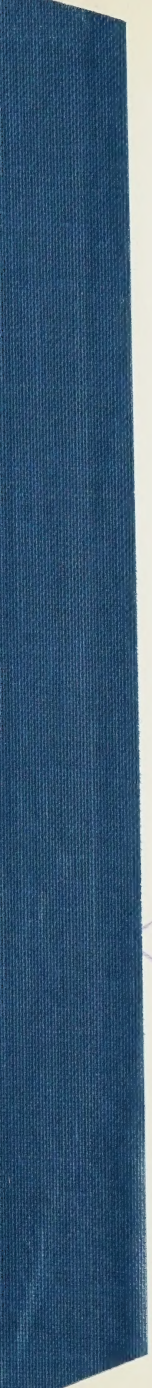

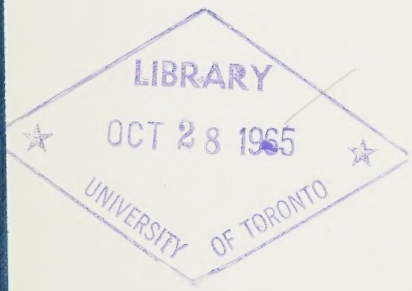

FILMSTRIP MANUAL

PUBLIC SEATING

NATIONAL DESIGN BRANCH
DEPARTMENT OF INDUSTRY
OTTAWA, CANADA

CAI ID
-65P77

PUBLIC SEATING

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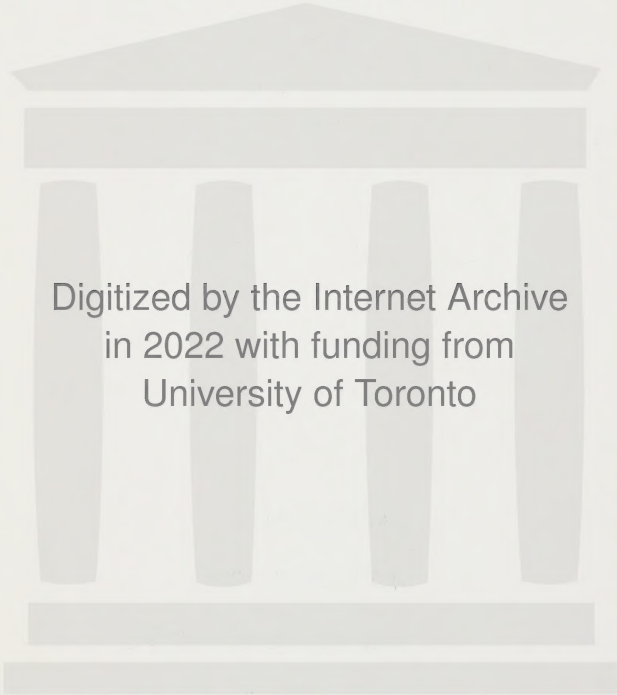
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INTRODUCTION

This filmstrip is one of several intended to assist the National Design Council in creating a greater awareness of the importance of design in industry.

In the filmstrip two aspects of PUBLIC SEATING are examined:

a) the design of good public seating

b) the purchase of good public seating

The filmstrip begins with a brief outline of the problem faced by the Department of Transport in providing suitable seating for Canada's new airports (frames 1 to 5). This is followed by a description of how one designer, Douglas Ball, Sunshine Office Furniture Limited, developed a suitable seat for Canada's new airports. This development is examined in the following stages:

STAGE 1 — ESTABLISH BASIC REQUIREMENTS (frames 6 to 11)

STAGE 2 — INVESTIGATE POSSIBLE SOLUTIONS (frames 12 to 19)

STAGE 3 — DEVELOPMENT OF PROTOTYPE (frames 20 to 36)

The next section of the filmstrip provides further examples of public seating in Canada's airports—produced by other Canadian designers and manufacturers (frames 37 to 45).

The filmstrip ends with a brief examination of the Department of Transport's invitation to manufacturers, the headings used in rating, seating submitted and the tender procedure.

DESIGN CASE STUDY — PUBLIC SEATING
by Douglas Ball.

March 1963

In a recent issue of Industrial Design an article appeared about seating. It began, and I quote, "We are constantly sitting : yet the design of good seating often escapes us.

"Designers, as well as consumers, are in constant quest of a chair that is comfortable for its purpose : working, dining, lounging, etc. Yet the general lines of a chair have not changed very much from the earliest prototypes".

The article goes on to say, "There are a number of reasons why good seating design is elusive. To begin with, sitting for prolonged periods of time is a recently acquired position of man, and came only with the advent of civilization. Primitive peoples to this day do not make much use of the sitting position, but use the more natural position of squatting".

It goes on to discuss the recent studies in anthropometry, anatomy, medical and human engineering research, which I know we all are familiar with.

The fact remains, however, that this knowledge has been with us for many years ; more and more designers and engineers are attempting to design chairs and have at their disposal almost unlimited technology, and yet the ideal chair that allows the individual to sit in it for an unlimited time has not been designed. There is doubt if it ever will be.

Perhaps this is proof that man was never meant to sit, and that we as designers should encourage the civilized societies to once again return to their more natural positions.

But what designer is prepared to launch such a trend?

We began almost two years ago to think once again of a new seat, but of a specific nature. It was to be a new type of public seating to be used in small or large quantities in public areas. It was to be used wherever people gathered to wait. It would be found in reception areas, in gigantic unsupervised, public areas. It might have to withstand twenty-four hour usage, seven days a week.

It would be competitively priced and offer a high degree of comfort for a duration of two hours.

The old standby in the past has been the wooden bench. This is still found in the Toronto Union Station and has proven to be easy to maintain and almost indestructible. These are two of the requisites of good public seating, but unfortunately, it could never be considered comfortable which must become the third requirement.

Our basic frame of reference was clear. The seating must be extremely durable; easy to maintain, and offer comfort of lounge standards.

Durability meant the seating must be rugged. It must be able to withstand the actions of children, vandals, the average individual who carelessly allows a cigarette to drop and burn on the seat. It must withstand cleaning equipment used by maintenance men. It must resist scuffing, staining or marking by sharp objects. It must be constructed so that parts will not break or become loose. If any part does become damaged, it must be easy to replace and if possible on the site.

Maintenance demanded that the seating be easy to clean. There should be no hard-to-get-at areas where dust could collect. There should be no welt around the seat to trap dirt or dust. Where there were large groups of seats in an area, the task of cleaning the floor around great numbers of legs becomes a tedious undertaking. Therefore, the point of contact between floor and seat becomes critical.

Comfort means simply that the seat must be, as well as look, comfortable to the weary traveller. It must be as suitable as possible for all ages, sizes and weights of people. It must support these people while they wait, rest, or read, but it should attempt to discourage the individual who is forced to find a comfortable but secluded bench to sleep on at night. It must offer comfort, but a different degree of comfort from the deep sprung airline or railway coach reclining chair.

My first approach was to create a deep cushioned, basically square seat which would appear to be part of the architecture. The point of departure was in fastening the units to the floor. To suggest a more permanent installation and simplify floor cleaning, I felt that perhaps we would investigate the possibility of supporting the row of seating by a number of simple columns which would be embedded in the floor. This would naturally only work where the furniture layout was decided upon and would remain the same indefinitely. However, this was the case with many public areas and seemed to warrant further investigation.

The upholstery was a rather conventional box cushion supported by rubber webbing and a tubular framework.

Once again as with other seats of this type on the market, it was possible to interchange tables with seat units and make up any combination. This column support allowed us to incorporate an ashtray which actually allowed ashes to drop into a cup which was recessed into the column.

The cushions were secured to the tubular frame by snap fasteners so that they could be removed, but it still required the reupholstery of a complete cushion and foam cushion in the event of damage. This solution was considered unsatisfactory.

We were still designing within our old frame of reference. The unit offered little or no product advantage save the rather controversial base support. Moreover, the box cushion, we had found, was difficult to upholster, the front edge would sag through use and corners tended to break down. We had simply restyled other existing and better seating already on the market.

The main problem was in the method of upholstery. I should say at this time that to some, the answer to all of our problems would have been a fibre glass shell. It would have certainly been durable and nothing could be simpler to maintain.

The problem is that the fibre glass bucket offers only a degree of comfort by limiting movement. This solution, while it continues to work extremely well for chairs where the user is seated in an upright position, has never worked successfully for a lounge chair, unless once again the shell is covered with some sort of resilient padding. A loose cushion would not be sufficient in this case because it would allow dirt to lie between the pad and the shell. The shell would out of necessity be completely covered and the advantage of fibre glass would be lost.

Our second solution consisted of a thinner pad which was suspended over rubber webbing. This was to be removable and we felt offered some advantage over the thicker cushion we had previously considered. We were still clinging to the column support although the suspension framework was more of a problem.

The top of the column was unsightly, the method of attaching it to the beams was crude and the whole understructure left something to be desired. One problem with webbing is that when sat on it stretches, and there must be room underneath for it to give. Also, it was felt exposed webbing in public areas might encourage children to pick at it.

Since we had deviated from the square, architectonic style of furniture, I was finding it increasingly difficult to successfully integrate a table into the structural framework. Perhaps there was no need for the provision of a table to be included on the same structure as that which supports the seats. With a more cantilevered style of seat, it would, I felt, look better to see just seats in one unbroken unit with a free standing table at the end, if it was required.

I began to question the validity of the column support. It certainly would restrict use of the furniture to new areas where the owners did

not object to drilling into the floor. The continuous seating seemed to consist in its simplest form of seats not joined together as such, but supported by beams which, in turn, were supported by leg supports. Next to the upholstery method, the greatest problem to overcome was the method in which these three elements would be integrated and joined together. One of the most difficult problems seems to forever be the joining of parts. When these parts are of different materials, the problem can become exceedingly complex.
I continued to experiment with a thinner, more contoured seat, and to commence thinking in terms of a cast aluminum base. I considered a formed tubular frame with rubber webbing, foam and vinyl upholstery. This time the back of the seat was upholstered to hide the webbing ; the seat rested on two beams which in turn were supported by the cast aluminum leg.
The ever familiar problems were still present. The seat unit, while still possible to do, was not a simple solution. It was not suitable as it contributed to poor quality of upholstery and was too costly to manufacture. It was too similar to other products on the market and had little or no product advantage. It did not satisfy our original frame of reference.
We had originally stated that we must solve the problems of maintenance, wear and comfort. As yet we had not answered any of the basic requirements. We were still searching for a new direction which until now had evaded us. We did not know what the solution might be. We did know what couldn't be done.
We relaxed from the problem for a number of months and at last began to think once again of the problems of public seating.
The definition of the problem remained the same. The requirements remained as before. The limitations seemed greater than ever. Limited production, tooling costs, available production techniques, the method which this product would be marketed, seemed destined to lead us again into the same blind alley.
Our solutions had been complex, and therefore, unsuitable. For a product to be well designed, it must, like nature, be simple in concept. It cannot be a new form which is sketched on paper, but must develop through an imaginary identification with the totality of the product in all its aspects : what it will do, what it will look like, how it will be made.
Durability—this really means that the greatest number of parts should be as indestructible as possible, and those which are susceptible to damage should be easily replaceable.
We had not yet solved the problem of upholstery, wear or damage. Our point of departure must be in this area. We had to reduce the

costly process of sewing, fabricating and applying the upholstery to the frame. It had to be quickly applied and easily removed. If simple enough, the damaged upholstery could be replaced with a new, inexpensive pad on the site. If it was exceptionally simple, it might even be repaired by an inexperienced maintenance man. While being simple, it also must be foolproof so that there was only one way which the pad could be applied. The most important factor was that it could not be removed by the person sitting in the seat, nor should it look as if it would come off easily.

I began to think of using a minimum amount of vinyl and attaching this to the supporting frame by a drawstring. This would certainly allow for easy replacement, but it also could be picked or rolled off by curious individuals. On the other hand, a drawstring becomes harder to remove if all points of the string, or wire, were under extreme tension. You create tension by keeping the string to a smaller circumference than the retaining lip of the frame and by not allowing it to be straight at any point on the frame. This meant that the ideal and most efficient drawstring would naturally be found on a round frame and the pad itself would become circular.

A constantly radiused board turned up on the sides to allow a moulded foam cushion to barely support the taut vinyl would provide enough outward thrust for the drawstring to work well. This approach seemed to have potential. It looked as if it could become comfortable and the drawstring principle might be developed into a workable solution. There seemed to be no reason why this would not be suitable for the back as well. The concave-convex cushion on paper at least appeared to give ideal support to the back. I decided that rather than prove my theories at this time, it would be better to take the solution further.

A back support was needed to hold the seat and back in their proper relationship. These in turn could be fastened to a beam or beams to support the other seats of the unit. By designing the base support to attach to the beams, it would allow them to be attached at any point along the beam making possible units of considerable length.

Our previous idea of a cast aluminum base was still worth considering because we could then design a sculptural base to complement the rather contoured seat and back. It was only sensible to consider cast aluminum for the supports as well.

At this time I was considering sand cast aluminum parts which would not be unsuitable for our scale of production. As an alternative to polishing, I was hoping to use a vinyl coating that we had been using on other products. This would give a smooth textured

finish and resist scuffing, and provide us with durable, easy to maintain parts that would require no costly welding, or weld buffing. At last the solution seemed to be in sight. Drawings were made, and since we were dealing with something quite sculptural, we constructed a half scale model to determine whether or not the aesthetics were pleasing.

I was satisfied that we were solving the problem within our frame of reference. There were several refinements to make from the model, but the general concept looked good enough to continue. The next stage was to commence testing for comfort. A crude but highly adjustable frame was constructed whereby we could experiment with seat height, back height, depth of seat, angle between back and seat, etc. Because of the unusual contour of cushions, we could not even begin to rely on human engineering data because this is generally concerned with only flat seat and back pieces.

We conducted tests with as diversified a number of people as possible until we were satisfied that we were giving the required comfort to the greatest number of people. We found that the angle between the seat and back must be greater than normal. The back was extended higher until it held the lumbar concavity firmly, and allowed space for the buttocks. The shoulders were gently supported by the back which in falling away from the body allows the sitter to slide forward in the chair and still have comfortable support at the shoulder level. The body weight is supported by the ischials, the lumbar region and the soles of the feet.

Most of the body weight is supported by the ischial tuberosities (bony protrusions on the underside of the pelvis). The undersides of the thighs are poorly constructed to support body weight as the soft part becomes compressed, which reduces blood circulation, affects the tendons of the muscle and puts pressure on the muscle nerves. The blood supply system, on the other hand, which passes over the tuberosities, is well adapted for weight bearing. However, the ischial area becomes uncomfortable and painful in prolonged seating, so that cushioning is required. A somewhat soft seat can distribute pressures better than a rigid one. We found that we had the greatest concentration of foam under the ischials and that the seat falls away gently relieving pressure on the underside of the thighs. The front edge cannot cut into the thighs.

The contours allow for unlimited change of position : sitting forward on the edge of the seat with your head on the back ; sitting sideways is unusually comfortable since there is room for your upper back and the arm rests comfortably on the back.

We also found that the best back height was the same length as the seat. This meant that the seat and back pieces were interchangeable with the advantage that the upholstery pads became common and only one standard size was needed for either piece.
The most complex problem to solve was the engineering of the drawstring upholstery. The pad must be simple to manufacture and assemble. It must look tailored and be impossible to pick off. However, it must come off and be replaced in the least possible time and by an inexperienced man without tools. To be foolproof there should only be one way to replace the pad so that no wrinkles appear.
We finally developed a system of hooks and wires. To attach the pad to the shell, which has the moulded foam cushion already attached, you simply hook the pad to the shell at each side. This centres and lines up the vinyl so that it has to go on properly. Next there are two hooks at the top and two more at the bottom which securely locate the pad to the shell. This means that one person can stretch the taut pad into the hooked position. Otherwise, it would take two or three men to hold the pad over the lip of the shell while the next one would pull the wire tight.
With the pad hooked at six points, one wire at a time is pulled tight and hooked into one of a series of holes. A stiff piano wire is used as this prohibits the pad from being pried up.
To remove, both wires are released and the pad is unhooked at each of the six points. The complete replacement takes no more than two minutes and as mentioned before, the same pad works on either seat or back.
We have applied for a patent on this feature.
The next stage was naturally the full scale prototype. Refinements were made to the base support. It was felt that the leg should be moved in from the end because the end elevation suggested a completely cantilevered structure, while the front elevation became a post and lintel system. By moving the leg in we created a more unified and completely cantilevered base. The two beams became standardized since the base had identical fastening to the beams front and rear.
The two back supports required for each seat unit were common. The leg casting could be fastened to the beams at any point making possible a centre leg for a longer unit. It was, therefore, possible by merely extending beams to make up to a five-seat unit.
As stated before, seat and back moulded cushions and pads were identical. With the exception of mounting holes, the moulded plywood boards were common. Therefore, any length of unit up to five

seats could be assembled from only six basic parts. This excluded moulded plastic glides and the hooking mechanism.
The complete unit can be assembled with one socket head wrench. Tolerances are generous and construction is exceptionally rapid. After cutting and sewing, the upholstery can be applied to a three-seat unit in approximately twelve minutes. This is a fraction of the time required to construct our older more conventional seating.
Where maintenance is concerned, burning cigarettes roll off the seat to the floor. There is no welt or hidden areas to capture dirt. The unit is high enough to permit machines to clean under it and the leg design contributes to easier maintenance of the floor. There are no slender points behind which to clean.
With the exception of the replaceable, all parts are extremely durable. The aluminum base may be polished or covered with an extremely tough cellulosic finish. The bar stock beams are bright chrome plated. The moulded birch plywood shells are coated with a natural acrylic finish which resists marking and scuffing from sharp objects.
To conclude I must say that the design is based on an aesthetic appreciation of the manner in which the product is made ; the dictation of the unit's appearance by what it is made of and how. The conceptual approach to design results, in this case, in the underside of the seat and framework being good-looking, not because anyone is ever going to look there, but just because.

DEPARTMENT OF TRANSPORT SPECIFICATIONS FOR FURNITURE IN PUBLIC AREAS OF AIR TERMINAL BUILDINGS

The following specifications were part of the Department of Transport's invitation to Canadian furniture manufacturers for submission of furniture samples suitable for the Department's Air Terminal Buildings.

Specifications for Chairs

Below is described an acceptable chair for furnishing waiting rooms in the Department of Transport's Terminal Buildings.

(a) Type

(1) The chair will be used singly, or ganged together in rows—either with or without intervening arms.

(2) It should be sufficiently heavy to discourage passengers from rearranging the furniture.

(3) It will have the seat and back cushioned with foam rubber cushions. The seat cushion shall be supported by elastic type webbing, tensioned in accordance with the manufacturer's recommendation. Seat cushions shall not be supported by a solid platform, nor cold-formed steel springs nor steel slats.

(4) It will present no edges or corners which could cause damage to persons or clothing.

(5) The chair should have a complementary table (see below), based on the same module as the chair and permitting "L", "T", "U", and "H" patterns to be assembled in room areas.

(b) Comfort

(1) The chair will be comfortable to the average person seated in it for short or long periods of time.

(2) It should be capable of factory variation in the angle of recline, to permit various degrees of comfort in various types of waiting areas.

(3) The arms will be so placed and designed as not to hinder the aged and infirm from getting out of the chair, yet be comfortable for others.

(4) The chair should give support to the small of the back and rise to support the full weight of the shoulder blades, but it should not be so high as to conflict with headgear.

(5) It should be properly proportioned in the seat length (front to back) in order to avoid discomfort at the back of the knees.

(c) Appearance

(1) A simple, straight-forward contemporary design will be viewed most favourably. Refinement of line, proportion and detailing will be more appreciated than ornamentation or "stylishness".

(2) Since the chair will frequently sit in the centre of an area, it must be designed to appear well when seen from all sides.

(d) Strength

(1) The chair must be structurally capable of supporting all ordinary or extraordinary abuse it may receive in public waiting rooms.

(2) Its glides must be capable of adjustment, and must last the life of the chair.

(e) Durability

(1) The frame must be finished so as not to mar with kicking, knocking with cleaning equipment, acids in cleaning

solutions, and any wear and tear short of willful damage. The finish must not break down in a manner which could snag and damage clothing.

(2) The fabric must have a life expectancy equal to the longest wearing fabric in commercial use. It must be resistant to fire, and damage from cigarette burns must not demand immediate replacement. The Department favours a breathing fabric, which feels neither cold and clammy in winter nor hot and sticky in summer, but this is not mandatory. The fabric must not split, tear, open along seams, stretch nor show imprints. In mounting it on the chair it shall not be stretched to diminish at all its normal strength.

(f) Maintenance

(Please note that many terminal buildings are cleaned by contract. The Department must give full consideration of the facility with which its buildings and their appointments may be maintained.)

Maintenance of Frame

(1) The frame must be finished so that it will wipe clean.

(2) Such damage as may occur to the structure and the finish must be capable of repair by resident maintenance staff.

Maintenance of Covers

(1) Covers must be readily and easily cleaned.

(2) All covered surfaces must be accessible for cleaning : in this regard it is mandatory that, in the design of the chair, the seat and the back be separated.

(3) Covers must be capable of easy replacement (from readily available stocks) by a maintenance staff of average skills. The department will be interested in manufacturers' proposals for replaceable covers, whether zippered, buttoned, or other.

Maintenance of Adjacent Areas

(1) The chair must present a minimum of interference with the cleaning of the floor beneath it.

(2) Chair glides must in no way damage the surfaces on which they rest or move, nor project in such a manner as to snag mops used in cleaning.

Specifications for Tables

Below is described an acceptable table for furnishing waiting rooms. The principles described in the Chair Specifications under (a) Type, part 4, (c) Appearance ; (d) Strength ; (e) Durability, part (1) ; and (f) Maintenance (Frame ; Adjacent Areas) ; shall apply to the specification for a table.

(a) Type
  (1) As noted in Part C, Para 3 above, the table is to be based on the same modular principle as the chairs, to render more flexible the organizing of seating in waiting room areas into "L", "T", "U" and "H" patterns.
  (2) Tables may be either slung between chairs, or supported on their own legs and ganged together with the chairs.
(b) Durability
  (1) Table tops will resist burns from cigarettes and scratches from baggage dragged across them.
(c) Maintenance
  (1) Table tops must wipe clean.
  (2) They will present no inside corners to collect dirt.

Specifications for Cigarette-Ash and Trash Receptacles

The principles described in the Chair specification under (c) Appearance; (d) Strength, part (1); (e) Durability part (1); (f) Maintenance, (Frame) shall apply to the specifications for receptacles.

(a) Type
  (1) Receptacles shall be of metal.
  (2) Four types are sought, to be related in design and material:
    a. A free-standing cigarette urn, of sufficient weight to discourage theft and rearranging, and of sufficient cross sectional area at the base to reduce the incidence to tipping over.
    b. A wall mounted ash receptacle.
    c. An ash tray fixed to, or set into, table tops.
    d. A trash receptacle of sufficient weight to discourage theft and re-arranging.
(b) Appearance
  (1) Please note particularly that a clean contemporary design will be looked for in these items.
  (2) The cigarette urn and the trash receptacle, though matching, should be so designed that the one cannot be mistaken for the other.
(c) Durability
  (1) Metal used will be of a gauge which can not readily be dented.
  (2) The working parts of any discharge mechanism shall be of the most durable quality obtainable.
  (3) Connections must not come apart or come loose under the severest possible use.

(d) Maintenance
   (1) Ease of discharge is of prime concern in the design of these receptacles.
   (2) The wall hung model must be designed to protect the wall to which it is fixed.

FILMSTRIP CAPTIONS AND COMMENTS

1. THE NATIONAL DESIGN COUNCIL OF CANADA presents
2. PUBLIC SEATING
   (Title over photograph of a chair designed by Douglas Ball for Sunshine Office Equipment Limited.) This chair is one of those developed to meet the public seating needs in Canada's new airports.
3. PROVIDING TODAY'S PUBLIC WITH SUITABLE SEATING IS A DEMANDING TASK. DESIGNERS, MANUFACTURERS AND PURCHASERS CONCERNED WITH FURNISHING PUBLIC AREAS MUST FIRST DEFINE THE FUNCTION OF THE SEATING AND THEN ESTABLISH WHAT IS REQUIRED IF THE SEATING IS TO FULFIL THE INTENDED FUNCTION. THE DEPARTMENT OF TRANSPORT FACED THIS PROBLEM IN FURNISHING CANADA'S NEW AIRPORTS.
4. THE DEPARTMENT WANTED SEATING OF CONTEMPORARY DESIGN IN KEEPING WITH THE AIRPORT ARCHITECTURE.
   (Photo of public seating in Malton Airport, Toronto; chair designed by Stefan Siwinski, Korina Design.) To facilitate the steadily increasing number of air travellers in Canada, the Department of Transport began, in 1958, to build a series of up-to-date air terminals at all the major and many of the smaller airports across Canada. To provide seating in keeping with the new buildings, the chief architect for the Air Services Branch of the Department of Transport, Mr. W. A. Ramsay, gave special attention both to the problem of obtaining the best possible seating and to its layout in the terminal settings. Up to that time, most of the new seating for Canada's air terminals had been imported, much of it from the United States. To foster higher standards of design in Canadian furniture, the department extended an invitation to Canadian manufacturers and designers to compete with the high standards of design set by the manufacturers of imported seating.
5. REQUIREMENTS WERE DETERMINED AND AN INVITATION EXTENDED TO CANADIAN MANUFACTURERS

AND DESIGNERS. THE FOLLOWING FRAMES SHOW HOW ONE DESIGNER TACKLED THE PROBLEM OF DEVELOPING A SUITABLE CHAIR.
(Text over chair designed by Douglas Ball, manufacturer, Sunshine Office Equipment Limited)

6. STAGE 1 — ESTABLISH
BASIC
REQUIREMENTS
(Subtitle frame, artwork background)
7. COMFORT—FOR ALL AGES AND ALL BUILDINGS FOR A PERIOD OF UP TO TWO HOURS.
(Cartoon illustrating the wide range of people public seating must accommodate).
"Comfort means simply that the seat must be, as well as look, comfortable to the weary traveller. It must support these people while they wait, rest, or read, but it should attempt to discourage the individual who is forced to find a comfortable but secluded bench to sleep on at night. It must offer comfort, but a different degree of comfort from the deep sprung airline or railway coach reclining chair" (D. Ball)
8. DURABILITY—OF THE HIGHEST COMMERCIAL STANDARD.
(Cartoon illustrating the need for durability in public seating)
"Durability means the seating must be rugged. It must be able to withstand the actions of children, vandals, the average individual who carelessly allows a cigarette to drop and burn on the seat. It must withstand cleaning equipment used by maintenance men. It must resist scuffing, staining or marking by sharp objects. It must be constructed so that parts will not break or become loose. If any part does become damaged, it must be easy to replace and if possible on the site". (D. Ball)
9. MAINTENANCE—EASE OF UPKEEP, OF CHAIR AND SURROUNDING AREA.
(Cartoon illustrating the cleaning problems presented by wrong sort of design for public seating)
"Maintenance demanded that the seating be easy to clean. There should be no hard-to-get-at areas where dust could collect. There should be no welt around the seat to trap dirt or dust. Where there are large groups of seats in an area, the task of cleaning the floor around great numbers of legs becomes a tedious undertaking. Therefore, the point of contact between floor and seat becomes critical". (D. Ball)

10. FLEXIBILITY—OF ARRANGEMENT.
(Cartoon illustrating the desirability of seating that can be flexibly arranged)
Seating of a design that would allow some flexibility in the manner of layout would provide the interior designers with best opportunity of developing pleasing and uncluttered terminal waiting rooms.
11. ONCE THE REQUIREMENTS WERE KNOWN, THE NEXT STEP WAS TO DEVELOP A BASIC CONCEPT THAT WOULD ALLOW THE SATISFYING OF THESE REQUIREMENTS.
(Cartoon illustrating the desirability of seating that can be flexibly arranged)
"Our basic frame of reference was clear. The seating must be extremely durable; easy to maintain, and offer comfort of lounge standards". (D. Ball).
12. STAGE 2 — INVESTIGATE
POSSIBLE
SOLUTIONS
EMPHASIZE DURABILITY: EASE OF MAINTENANCE.
(Subtitle frame, artwork background)
13. WEAKNESSES AND STRENGTHS OF THE CHAIRS ARCHETYPE WERE CONSIDERED.
(Photograph of public seating in a railway station—the traditional wooden bench)
"The old standby in the past has been the wooden bench. This is still found in the Toronto Union Station and has proven to be easy to maintain and almost indestructible. These are two of the requisites of good public seating, but unfortunately, it could never be considered comfortable which must become the third requirement". (D. Ball)
14. FIRST IDEA . . . AN UPHOLSTERED BENCH SUPPORTED ON EMBEDDED COLUMNS.
(Sketch of the first chair design idea)
"My first approach was to create a deep cushioned, basically square seat which would appear to be part of the architecture. The point of departure was in fastening the units to the floor. To suggest a more permanent installation and simplify floor cleaning, I felt that perhaps we would investigate the possibility of supporting the row of seating by a number of simple columns which would be embedded in the floor. This would naturally only work where the furniture layout was decided upon and would remain the same indefinitely. However, this was the case

with many public areas and seemed to warrant further investigation.
The upholstery was a rather conventional box cushion supported by a rubber webbing and a tubular framework." (D. Ball)

15. COLUMN CONCEPT ALLOWED FOR THE INCORPORATION OF A TABLE AND ASH TRAY.
(Sketch of same chair idea, indicating how table and ashtray could be incorporated).
"Once again as with other seats of this type in the market, it was possible to interchange tables with seat units and make up any combination. This column support allowed us to incorporate an ashtray which actually allowed ashes to drop into a cup which was recessed into the column.
The cushions were secured to the tubular frame by snap fasteners so that they could be removed, but it still required the re-upholstery of a complete cushion and foam cushion in the event of damage". (D. Ball)
16. REJECT BOX SEAT — DURABILITY QUESTIONABLE, DESIGN LACKING PRODUCT IDENTITY.
(Sketch as in frame 15)
"This solution was considered unsatisfactory. We were still designing within our old frame of reference. The unit offered little or no product advantage save the rather controversial base support. Moreover, the box cushion, we had found, was difficult to upholster, the front edge would sag through use and corners tended to break down. We had simply restyled other existing and better seating already on the market". (D. Ball)
17. TRY CONTOURED SEAT — OFFERS GREATER COMFORT, MORE DISTINCTIVE APPEARANCE.
(Sketch, contoured seat idea employing fibre glass)
The main problem was in the method of upholstery. I should say at this time that to some, the answer to all of our problems would have been a fibre glass shell. It would have certainly been durable and nothing could be simpler to maintain. The problem is that the fibre glass bucket offers only a degree of comfort by limiting movement. This solution, while it continues to work extremely well for chairs where the user is seated in an upright position, has never worked successfully for a lounge chair, unless once again the shell is covered with some sort of resilient padding. A loose cushion would not be sufficient in this case because it would allow dirt to lie between the pad and the shell. The shell would out of necessity be completely covered and the advantage of fibre glass would be lost.

18. REJECT COLUMNS — APPEARANCE TOO HEAVY WITH CONTOURED SEAT, ATTACHMENT POOR.
(Sketch, contoured seat idea with webbing)
"Our second solution consisted of a thinner pad which was suspended over rubber webbing. This was to be removable and we felt offered some advantage over the thicker cushion we had previously considered. However, one problem with webbing is that when sat on it stretches, and there must be room underneath for it to give. Also, it was felt exposed webbing in public areas might encourage children to pick at it.
I began to question the validity of the column support. It certainly would restrict use of the furniture to new areas where the owners did not object to drilling into the floor. Further, the top of the column was unsightly, the method of attaching it to the beams was crude and the whole under structure left something to be desired". (D. Ball)
19. ESTABLISHED — A CONTOURED SEAT, SUPPORTED BY LEGS AND BEAMS WOULD BEST SATISFY THE REQUIREMENTS OF COMFORT, DURABILITY, MAINTENANCE, FLEXIBILITY AND APPEARANCE.
(Text below schematic sketch of the type of seat that *would best allow* fulfilment of the design requirements.)
"Since we had deviated from the square, architectonic style of furniture, I was finding it increasingly difficult to successfully integrate a table into the structural framework. Perhaps there was no need for the provision of a table to be included on the same structure as that which supports the seats. With a more cantilevered style of seat, it would, I felt, look better to see just seats in one unbroken unit with a free standing table at the end, if it was required . . . The continuous seating seemed to consist in its simplest form of seats not joined together as such, but supported by beams which, in turn, were supported by leg supports". (D. Ball)
20. STAGE 3 — DEVELOPMENT OF PROTOTYPE
1. SEAT
2. HORIZONTAL BEAMS
3. LEGS
(Subtitle frame with a schematic sketch of the three elements to be developed).
21. WHAT WOULD MAKE A GOOD SEAT?
— DURABILITY
— COMFORT
— IF POSSIBLE — A READILY INTERCHANGEABLE FABRIC.

(Text frame)
I continued to experiment with a thinner, more contoured seat, and to commence thinking in terms of a cast aluminium base. I considered a formed tubular frame with rubber webbing, foam and vinyl upholstery. This time the back of the seat was upholstered to hide the webbing ; the seat rested on two beams which in turn were supported by the cast aluminium leg.
"The ever familiar problems were still present. The seat unit, while still possible to do, was not a simple solution. It was not suitable as it contributed to poor quality of upholstery and was too costly to manufacture. It was too similar to other products on the market and had little or no product advantage. It did not satisfy our original frame of reference.
We had originally stated that we must solve the problems of maintenance, wear and comfort. As yet we had not answered any of the basic requirements. We were still searching for a new direction which until now had evaded us. We did not know what the solution might be. We did know what couldn't be done.
We relaxed from the problem for a number of months and at last began to think once again of the problems of public seating.
The definition of the problem remained the same. The requirements remained as before. The limitations seemed greater than ever. Limited production, tooling costs, available production techniques, the method which this product would be marketed, seemed destined to lead us again into the same blind alley.
Our solutions had been complex, and therefore, unsuitable.
For a product to be well designed, it must, like nature, be simple in concept. It cannot be a new form which is sketched on paper, but must develop through an imaginary identification with the totality of the product in all its aspects : what it will do, what it will look like, how it will be made.
Durability—this really means that the greatest number of parts should be as indestructible as possible, and those which are susceptible to damage should be easily replaceable.
We had not yet solved the problem of upholstery, wear or damage. Our point of departure must be in this area. We had to reduce the costly process of sewing, fabricating and applying the upholstery to the frame. It had to be quickly applied and easily removed. If simple enough, the damaged upholstery could be replaced with a new, inexpensive pad on the site. If it was exceptionally simple, it might even be repaired by an inexperienced maintenance man. While being simple, it also must be foolproof so that there was only one way which the pad

could be applied. The most important factor was that it could not be removed by the person sitting in the seat, nor should it look as if it would come off easily". (D. Ball)

22. INTERCHANGEABLE FABRIC—VINYL KEPT TAUT OVER PLYWOOD BY A DRAWSTRING.
(Sketch of idea for stretching vinyl fabric over a radial frame.)
"I began to think of using a minimum amount of vinyl and attaching this to the supporting frame by a drawstring. This would certainly allow for easy replacement, but it also could be picked or rolled off by curious individuals. On the other hand, a drawstring becomes harder to remove if all points of the string, or wire, were under extreme tension. You create tension by keeping the string to a smaller circumference than the retaining lip of the frame and by not allowing it to be straight at any point on the frame. This meant that the ideal and most efficient drawstring would naturally be found on a round frame and the pad itself would become circular". (D. Ball)
23. MOULDED PLYWOOD WOULD MAKE A STURDY DURABLE FRAME.
(Photo of contoured radial plywood frame developed for seat.)
"A constantly radiused board turned up on the sides to allow a moulded foam cushion to barely support the taut vinyl would provide enough outward thrust for the drawstring to work well. This approach seemed to have potential. It looked as if it could become comfortable and the drawstring principle might be developed into a workable solution". (D. Ball)
24. CONTOURED PADDING OF FOAM RUBBER WOULD BE FIXED TO THE FRAME.
(Artwork—profile of chair—with the seat shown in cross section indicating shape and position of foam rubber padding)
"There seemed to be no reason why this would not be suitable for the back as well. The concave-convex cushion on paper at least appeared to give ideal support to the back."
25. THE SIMPLICITY OF THE DESIGN WOULD MAKE FABRICATION EASY.
(Photo of the three pieces making up the seat of the chair—frame, padding and vinyl cover.)
26. A DRAWSTRING OF STIFF PIANO WIRE WOULD RESTRICT TAMPERING.
(Photo of the back of a seat showing the hooking mechanism of piano wire drawstrings and perforated metal plate set into the plywood frame.)
"The most complex problem to solve was the engineering of the

drawstring upholstery. The pad must be simple to manufacture and assemble. It must look tailored and be impossible to pick off. However, it must come off and be replaced in the least possible time and by an inexperienced man without tools. To be foolproof there should only be one way to replace the pad so that no wrinkles appear.

We finally developed a system of hooks and wires. To attach the pad to the shell, which has the moulded foam cushion already attached, you simply hook the pad to the shell at each side. This centres and lines up the vinyl so that it has to go on properly. Next there are two hooks at the top and two more at the bottom which securely locate the pad to the shell. This means that one person can stretch the taut pad into the hooked position. Otherwise, it would take two or three men to hold the pad over the lip of the shell while the next one would pull the wire tight.

With the pad hooked at six points, one wire at a time is pulled tight and hooked into one of a series of holes. A stiff piano wire is used as this prohibits the pad from being pried up.

To remove, both wires are released and the pad is unhooked at each of the six points. The complete replacement takes no more than two minutes and as mentioned before, the same pad works on either seat or back.

We have applied for a patent on this feature" (D. Ball)

27. RESULT—A DURABLE, DIRT RESISTANT SEAT: MINIMUM VINYL, SHORT REPLACEMENT TIME.
(Photo of the assembled seat and back units and the back supports used)
"A back support was needed to hold the seat and back in their proper relationship. These in turn could be fastened to a beam or beams to support the other seat of the unit". (D. Ball)
28. WHAT ABOUT LEGS AND BEAMS?
1. SEAT
2. BEAMS
3. LEGS
(Text frame with artwork background)
29. LOW COST, SAND CAST ALUMINIUM CHOSEN FOR LEGS.
(Photo of cast aluminium legs)
"Our previous idea of a cast aluminium base was still worth considering because we could then design a sculptural base to complement the rather contoured seat and back. It was only sensible to consider cast aluminium for the supports as well.

At this time I was considering sand cast aluminium parts which would not be unsuitable for our scale of production. As an alternative to polishing, I was hoping to use a vinyl coating that we had been using on other products. This would give a smooth textured finish and resist scuffing, and provide us with durable, easy to maintain parts that would require no costly welding, or weld buffing". (D. Ball)

30. SCULPTURAL QUALITIES POSSIBLE WITH CASTING WOULD COMPLEMENT SEAT CONTOURS.
(Photo of assembled chair in profile to illustrate relationship of legs to seat and back)

31. BAR STOCK BEAMS, LEGS AND SEAT WOULD FASTEN TOGETHER SIMPLY.
(Photo illustrating how the heavy beams rest on the legs and provide a cradle for the seat and back unit)
"By designing the base support to attach to the beams, it would allow them to be attached at any point along the beam making possible units of considerable length". (D. Ball)

32. A HALF SCALE MODEL WAS BUILT TO STUDY APPEARANCES.
(Photo of the half scale model used to examine the chair's appearance)
"At last the solution seemed to be in sight. Drawings were made, and since we were dealing with something quite sculptural, we constructed a half scale model to determine whether or not the aesthetics were pleasing.
I was satisfied that we were solving the problem within our frame of reference. There were several refinements to make from the model, but the general concept looked good enough to continue" (D. Ball)

33. A FULL SCALE ADJUSTABLE CHAIR WAS MADE TO TEST FOR COMFORT.
(Sketch of the adjustable chair used in testing slope and cushion positions for seat and back)
"The next stage was to commence testing for comfort. A crude but highly adjustable frame was constructed whereby we could experiment with seat height, back height, depth of seat, angle between back and seat, etc. Because of the unusual contour of cushions, we could not even begin to rely on human engineering data because this is generally concerned with only flat seat and back pieces. We conducted tests with as diversified a number of people as possible until we were satisfied that we were giving the required comfort to the greatest number of people". (D. Ball)

34. IDEAL SUPPORT AND COMFORT WAS POSSIBLE USING THE SAME UNIT FOR BACK AND SEAT.
(Sectional sketch showing ideal support achieved by the chair)
"We found that the best back height was the same length as the seat. This meant that the seat and back pieces were interchangeable with the advantage that the upholstery pads became common and only one standard size was needed for either piece. We also found that the angle between the seat and back must be greater than normal. The back was extended higher until it held the lumber concavity firmly, and allowed space for the buttocks. The shoulders were gently supported by the back which in falling away from the body allows the sitter to slide forward in the chair and still have comfortable support at the shoulder level. The bodyweight is supported by the ischials, the lumber region and the soles of the feet.
Most of the bodyweight is supported by the ischial tuberosities (bony protrusions on the underside of the pelvis). The undersides of the thighs are poorly constructed to support body weight as the soft part becomes compressed, which reduces blood circulation, affects the tendons of the muscle and puts pressure on the muscle nerves. The blood supply system, on the other hand, which passes over the tuberosities, is well adapted for weight bearing. However, the ischial area becomes uncomfortable and painful in prolonged seating, so that cushioning is required.
A somewhat soft seat can distribute pressures better than a rigid one. We found that we had the greatest concentration of foam under the ischials and that the seat falls away gently relieving pressure on the underside of the thighs. The front edge cannot cut into the thighs.
The contours allow for unlimited change of positions : sitting forward on the edge of the seat with your head on the back ; sitting sideways is unusually comfortable since there is room for your upper back and the arm rests comfortably on the back".
(D. Ball)

35. THE FINAL RESULT —
COMFORT • DURABILITY • MAINTENANCE
FLEXIBILITY • APPEARANCE • COST
2 TO 5 SEATS IN A UNIT
ONLY 6 BASIC PARTS
COMPLETE ASSEMBLY WITH SOCKET-HEAD WRENCH AND BUTTON HOOK
(Text summarizing the requirements satisfied by the design of the chair and composite photographs of the six basic parts.)

"The two back supports required for each seat unit were common. The leg casting could be fastened to the beam at any point making possible a centre leg for a longer unit. It was, therefore, possible by merely extending beams to make up to a five-seat unit.

As stated before, seat and back moulded cushions and pads were identical. With the exception of mounting holes, the moulded plywood boards were common. Therefore, any length of unit up to five seats could be assembled from only six basic parts. This excluded moulded plastic glides and the hooking mechanism.

The complete unit can be assembled with one socket head wrench. Tolerances are generous and construction is exceptionally rapid. After cutting and sewing, the upholstery can be applied to a three-seat unit in approximately twelve minutes. This is a fraction of the time required to construct our older more conventional seating.

36. (No caption)

(Photo of the finished chair designed by Douglas Ball and manufactured by Sunshine Office Equipment Limited. The chair is used in the Main Departure Room of Edmonton Airport.)

". . . In the full scale prototype it was felt that the leg should be moved in from the end because the end elevation suggested a completely cantilevered structure, while the front elevation became a post and lintel system. By moving the leg in we created a more unified and completely cantilevered base. The two beams standardized since the base had identical fastening to the beams front and rear.

Where maintenance is concerned, burning cigarettes roll off the seat to the floor. There is no welt or hidden areas to capture dirt. The unit is high enough to permit machines to clean under it and the leg design contributes to easier maintenance of the floor. There are no slender points behind which to clean.

With the exception of the replaceable pads, all parts are extremely durable. The aluminium base may be polished or covered with an extremely tough cellulosic finish. The bar stock beams are bright chrome plated. The moulded birch plywood shells are coated with a natural acrylic finish which resists marking and scuffing from sharper objects.

To conclude I must say that the design is based on an aesthetic appreciation of the manner in which the product is made: the dictation of the unit's appearance by what it is made of and how. The conceptual approach to design results, in this case, in the

underside of the seat and framework being good-looking, not because anyone is ever going to look there, but just because". (D. Ball)

37. FOLLOWING ARE SOME FURTHER EXAMPLES OF THE AIRPORT SEATING PRODUCED BY CANADIAN MANUFACTURERS AND DESIGNERS. DIFFERENCES IN INTENDED FUNCTION AND IN THE APPROACH TAKEN BY EACH DESIGNER HAS PRODUCED SEATING WIDELY VARIED IN APPEARANCE BUT OF A DESIGN QUALITY THAT IS UNIFORMLY HIGH.
(Text frame)

38. (No caption)
(Photo of a chair designed by Walter Nugent and manufactured by Walter Nugent Limited—installed in the Main Departure Room of Winnipeg Airport (Stevenson Field).
A chair that adapts to the sitter. This is accomplished by the four point suspension of the chair's steel frame which flexes with the weight of the occupant. The original wooden base was replaced with a metal base for use in the new airports. The chair took several years to develop. It is now sold widely in the Canadian market.

39. (No caption)
(Photo of a chair designed by Stefan Siwinski and manufactured by Korina Design—installed in the Main Departure Room of Toronto Airport (Malton). A luxury type of chair with a contoured seat that took Siwinski four years to develop. (This development took place prior to the invitation from the Department of Transport, although minor modifications were made for use in the airports i.e., removal of buttons in upholstering). The back and sides of the frame is made of plywood with softwood used in the front. The sides protect and hold the foam rubber filling. Legs are of welded steel, ground burnished and then brushed to a chrome finish.

40. (No caption)
(Photo of seating designed by Robin Bush, Robin Bush Associates and Manufactured by Canadian Office and School Furniture Limited—installed in the Main Departure Room, Ottawa Airport).
"PRISMASTEEL COMPONENT SEATING—P.C.S.—designed for Herman Miller Inc. of Zeeland, Michigan and manufactured under licence in Canada by C.O.S.F. (Canadian Office and School Furniture) of Preston, Ontario. The first series of P.C.S. were the (No. 489) armchairs and the armless one,

two and three seat unit designed in 1956. The idea was to make a seating group that was light in scale, still extremely durable if used in public areas. At this time there was no furniture made in Canada that would meet this requirement.

Now a couple of years later, Gander Airport came along and D.O.T. asked Canadian manufacturers to submit their seating for evaluation and testing. At this time I designed a further series of P.C.S., the interlocking seat-table and ottoman units that now comprise the bulk of the seating in Gander, Dorval, Malton, Saint John, Regina and many other small terminals.

The design principle was to provide a very linear appearance and absolute planning flexibility. By interlocking units in any direction, a seating plan could be developed by designers that would remain static despite crowds and cleaning crews". (R. Bush)

41. (No caption)

(Photo of seating designed by Robin Bush, Robin Bush Associates and manufactured by Canadian Office and School Furniture Limited—installed in the Main Departure Room, Montreal Airport, Dorval)

"CUSTOM SEATING UNIT—Dorval designed for Herman Miller as a contract special. D.O.T. (Stan White) asked me to design something for the main areas as a large amount of P.C.S. was being specified in ticketing concourses. This rather baroque thing was an experiment in connecting steel strap and the laminated wood upholstery frame" (R. Bush)

42. (No caption)

(Photo of seating designed by Murray Oliver and manufactured by T. Eaton Company—installed in the Dining Room of Toronto Airport (Malton)

"The chair is rectilinear, taking its form from the building itself, repeating the proportions of the walnut and travertine wall areas. The materials are (steel and vinyl), a design statement repeated from other areas. The steel legs in brushed chrome echoing the stainless steel column enclosures. The low back was indicated by the proportions of the area—its extreme length with related ceiling height. Comfort being a major factor, an arm chair was developed to accommodate both Dining and Bar Lounge requirements". (Murray Oliver)

43. (No caption)

(Photo of seating designed by Robin Bush, Robin Bush Associates and manufactured by Canadian Office and School Furniture Limited—installed in the Customs Area of Toronto Airport (Malton).

"TERMINAL COMPONENT SEATING nicknamed "Lollypop" designed for C.O.S.F. Light scale, durable seating with a minimum leg structure was needed for the confined areas such as holding rooms in Malton. This was a very difficult unit to design as the weight load transferred to the connection of the leg dictated a rather heavy joint. It was solved by piercing the heavy wall tubing with the solid upright leg member".
(R. Bush)

44. (No caption)
(Photo of seating designed by Eric Brown and manufactured by Polyfibre Limited—installed in a concourse area of Montreal Airport (Dorval)
POLYFIBRE BENCH manufactured in glass fibre and reinforced polyester. In the photo it is cantilevered from the wall; it can also be used on a free standing base. Due to its very high durability it can be used outdoors as well as indoors.

45. (No caption)
(Photo of seating designed by Robin Bush, Robin Bush Associates and manufactured by Canadian Office and School Furniture—installed at Toronto Airport (Malton)
TERMINAL BENCH—"This is not really furniture . . . it is an architectural element in open spaces. The critical design problem was ensuring stability, freedom from warping and splitting in timber of this dimension". (R. Bush)

46. FROM THE DEPARTMENT OF TRANSPORT INVITATION TO CANADIAN FURNITURE MANUFACTURERS:
"... THIS PROCEDURE HAS BEEN DEVELOPED IN ORDER TO PERMIT THE DEPARTMENT TO COMPILE A LIST OF ACCEPTABLE FURNITURE FOR DESIGNERS TO USE IN FURNISHING INTERIORS OF NEW TERMINAL BUILDINGS . . .
(Text frame)

47. . . . THERE ARE AREAS IN THESE BUILDINGS WHICH VARY BOTH IN CHARACTER AND COST OF THEIR APPOINTMENTS, SO THAT FURNITURE OF VARYING DESIGNS AND PRICE WILL BE CONSIDERED".
(Text frame)
For further information read
BACKGROUND NOTE Department of Transport Specifications for Furniture in Public Areas of Air Terminal Buildings.

48. FURNITURE THAT PASSED THE FOLLOWING RATING

TEST WAS LISTED WITH ITS APPROPRIATE GROUP RATING TEST HEADINGS

APPEARANCE
COMFORT
STRENGTH
QUALITY OF WORKMANSHIP
ARMS
GLIDES

(Text frame first half of Rating Test Headings)
From the DOT Invitation :
Appearance

(1) A simple, straight-forward contemporary design will be viewed most favourably. Refinement of line, proportion and detailing will be more appreciated than ornamentation or "stylishness".
(2) Since the chair will frequently sit in the centre of an area, it must be designed to appear well when seen from all sides.

Comfort

(1) The chair will be comfortable to the average person seated in it for short or long periods of time.
(2) It should be capable of factory variation in the angle of recline, to permit various degrees of comfort in various types of waiting areas.
(3) The arms will be so placed and designed as not to hinder the aged and infirm from getting out of the chair, yet be comfortable for others.
(4) The chair should give support to the small of the back and rise to support the full weight of the shoulder blades, but it should not be so high as to conflict with headgear.
(5) It should be properly proportioned in the seat length (front to back), in order to avoid discomfort at the back of the knees.

Strength

(1) The chair must be structurally capable of supporting all ordinary or extraordinary abuse it may receive in public waiting rooms.
(2) Its glides must be capable of adjustment, and must last the life of the chair.

49. DURABILITY OF SUSPENSION SYSTEM
MAINTENANCE OF FRAME
EASE OF RE-UPHOLSTERING
SUITABILITY
OBSTRUCTION TO CLEANERS
SIZE AND WEIGHT

FLEXIBILITY OF GROUPING
TABLE
PRICE (VALUE)
(Text frame—Rating Test Headings continued from frame 48)
Durability
(1) The frame must be finished so as not to mar with kicking, knocking with cleaning equipment, acids in cleaning solutions, and any wear and tear short of wilful damage. The finish must not break down in a manner which could snag and damage clothing.
(2) The fabric must have a life expectancy equal to the longest wearing fabric in commercial use. It must be resistant to fire, and damage from cigarette burns must not demand immediate replacement. The Department favours a breathing fabric, which feels neither cold and clammy in winter nor hot and sticky in summer, but this is not mandatory. The fabric must not split, tear, open along seams, stretch nor show imprints. In mounting it on the chair it shall not be stretched to diminish at all its normal strength.

Maintenance
(Please note that many terminal buildings are cleaned by contract. The Department must give full consideration of the facility with which its buildings and their appointments may be maintained.)

Maintenance of Frame
(1) The frame must be finished so that it will wipe clean.
(2) Such damage as may occur to the structure and the finish must be capable of repair by resident maintenance staff.

Maintenance of Covers
(1) Covers must be readily and easily cleaned.
(2) All covered surfaces must be accessible for cleaning: in this regard it is mandatory that, in the design of the chair, the seat and the back be separated.
(3) Covers must be capable of easy replacement (from readily available stocks) by a maintenance staff of average skills. The Department will be interested in manufacturers' proposals for replaceable covers, whether zippered, buttoned, or other.

Maintenance of Adjacent Areas
(1) The chair must present a minimum of interference with the cleaning of the floor beneath it.
(2) Chair glides must in no way damage the surfaces on

which they rest or move, nor project in such a manner as to snag mops used in cleaning.

50. (Text with artwork)
AIRPORT TERMINAL
Main Waiting Area
Type "A" Chairs
Specified Nos. 1 or 6
Departure Areas
Type "B" Chairs
Specified Nos. 2, 4 or 6
Lounge Areas
Type "C" Chairs
Specified Nos. 1, 2 or 7
TWO OR THREE DESIGNS OF SUITABLE TYPE AND QUALITY WERE SPECIFIED FOR EACH AREA, ONE OF WHICH THE CONTRACTOR WAS REQUIRED TO SUPPLY.

GENERAL NOTES from DOT — Invitation

Notice of Acceptance
A list will be compiled of all items acceptable to the Department showing the manufacturer and code number of each item accepted. This list will be distributed to all who submit samples.
The Department may, if found practical, advise a manufacturer directly of a provision approval respecting any submission.
The manufacturer may if desired make such modifications or improvement suggested by the department and re-submit for approval. The item is then accepted by the department.
The list will be revised to incorporate the additional name of manufacturer and code number and the list will be re-issued to all. Any such re-submissions may not be made if there is any increase in price per unit. (Reference Invitation to Submit Para 5.)
Tender Procedure
As previously stated, this procedure has been developed in order to permit the department to compile a list of acceptable furniture for designers use in furnishing interiors of New Terminal Buildings. (Gander and Uplands excepted due to shortage of time.)
The department can give no guarantee to any manufacturer that any item will be specified or used in any building but it is expected that variations in requirements will permit each manufacturer to tender on some phases of the department's overall requirements.

Guarantee

Each and every item delivered pursuant to the award of a tender, will be identical in every respect to the approved sample, and to the specification in the brochure covering that item.

The department will reserve the right of inspection during manufacture, and any deviations will render the complete order subject to rejection by the department and deletion of such item from the approved list.

The general acceptance of any item by the department will not in any way relieve the supplier from a guarantee of a complete satisfaction for a period of at least 12 months following the date that the item was put into use by the department.

51. ACKNOWLEDGEMENT IS MADE TO ERIC BROWN, POLYFIBRE LIMITED; ROBIN BUSH, ROBIN BUSH ASSOCIATES; CANADIAN OFFICE AND SCHOOL FURNITURE LIMITED; WALTER NUGENT, WALTER NUGENT LIMITED; MURRAY OLIVER, T. EATON COMPANY AND STEFAN SIWINSKI, KORINA DESIGN. FOR THEIR SPECIAL ASSISTANCE, OUR THANKS TO DOUGLAS BALL; SUNSHINE OFFICE EQUIPMENT LIMITED AND THE DEPARTMENT OF TRANSPORT.

52. Director — Don Hopkins
Photographers — Herb Taylor, David Portigal
Art Director — J. Licastro
Executive Producer — Hans Moller

53. PUBLIC SEATING
Produced for the
NATIONAL DESIGN COUNCIL OF CANADA
by the
NATIONAL FILM BOARD OF CANADA

Other National Design Council of Canada filmstrips and manuals in production.

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—(B&W) $2.00 per copy
—U.S. & Abroad—Please consult National Film Board representative.

The above filmstrips available in single frame slide form.

Extra copies Filmstrip Manuals available through the Queen's Printer, Ottawa, Canada.

THE CARE OF FILMSTRIPS

A torn, scratched or blurred filmstrip is more of an exasperation than a help to a teacher. For this reason it is sensible to take a few simple precautions to keep filmstrips in good condition.

Filmstrips suffer most from careless handling, dust and grease. To avoid these, they should be handled by the edge with clean fingers, should be kept off the floor when re-rolling, and should be stored in their dust-proof containers.

Filmstrips should be inspected and cleaned regularly; if a strip has become smeared by an oily machine it should be cleaned before storing. A soft cloth moistened with a film cleaner is best.

Damage to the sprocket holes of a filmstrip may occur in use. If, after careful threading, a strip should by accident jump from the sprockets, if should be re-threaded immediately.

Scratches can be avoided by using a clean machine. Those surfaces of the projector which are in contact with the film should be cleaned frequently to ensure that they are spotless.

When finished with a filmstrip, roll it end first, emulsion side out, and replace it in the proper container.

If from repeated use a filmstrip becomes dry and brittle, it should be hung where a little moisture may be absorbed. *Do not wet a filmstrip;* hang it in a cool cupboard above a pan of water.

Filmstrips should at all times be stored away from radiators and other heat sources.

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ott

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